



# ***JPRS Report***

# **Science & Technology**

***USSR: Chemistry***

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# Science & Technology

## USSR: Chemistry

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20 July 1989

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UDC 541.11:536.722:622.232.1:547.232

**Thermochemistry of Trinitroglycerine**

18410077d Moscow IZVESTIYA AKADEMII NAUK  
SSSR: SERIYA KHIMICHESKAYA in Russian  
No 9, Sep 88 (manuscript received  
23 Apr 87) pp 1988-1992

[Article by Ye. A. Miroshnichenko, L. I. Korchatova, V. P. Shelaputina, S. A. Zyuzkevich, and Yu. A. Lebedev, Institute of Chemical Physics, USSR Academy of Sciences, Moscow, Moscow Institute of Chemical Engineering imeni D. I. Mendeleyev]

[Abstract] Thermochemical investigation of quantitatively-pure trinitroglycerine (TNG) was carried out measuring the combustion energy, evaporation enthalpy, and enthalpies of solution and dilution. Analytical material was prepared on site to assure high purity of the sample. On the basis of solvation effects, the thermodynamic parameters of intermolecular interactions were evaluated in liquid TNG and in its solution. It was concluded that TNG is a strongly associated liquid whose dissociation begins to appear only in highly diluted state of the order of square root of  $m < 0.2$ . Figure 1; references 15: 11 Russian (2 by Western authors), 4 Western.

UDC 541.14:542.944:547.246'131

**Study of Methyltrichlorogermanium Chlorination Initiated With Laser Radiation**

18410077g Moscow IZVESTIYA AKADEMII NAUK  
SSSR: SERIYA KHIMICHESKAYA in Russian  
No 9, Sep 88 (manuscript received  
3 Jul 87) pp 2167-2170

[Article by G. Ya. Zuyeva, T. I. Khaustova, and N. V. Serezhkina, Institute of General Physics, USSR Academy of Sciences, Moscow]

[Abstract] Detailed investigation of the effect of laser radiation on chlorination of  $\text{CH}_3\text{GeCl}_3$  is reported, concentrating on the formation of  $\text{CH}_2\text{ClGeCl}_3$  as a function of the intensity, wavelength and frequency of pulses of various UV range lasers. Chlorination was performed with removal and with retention of the reaction product from the reaction zone. It was shown that for the first two hours the predominant (80-50%) product of the reaction was  $\text{CH}_2\text{ClGeCl}_3$  regardless of whether the reaction product was removed or not. When two independent beams were used to intensify the radiation and to increase the yield of  $\text{CH}_2\text{ClGeCl}_3$ , it was discovered that the results were the same as with one beam. Evidently the intensity of 4 mW was adequate for this reaction and the excess energy had no additional value. When compared to a Hg lamp, the laser beam showed greater selectivity because of its pulse mode of action: it made it possible to remove the chlorinated product from the reaction zone during the intervals between pulses. Figures 3; references 6: 5 Russian, 1 Western.

UDC 541.128:546.718

**Catalytic Properties of Some Technetium Compounds**

18410077a Moscow IZVESTIYA AKADEMII NAUK  
SSSR: SERIYA KHIMICHESKAYA in Russian  
No 9, Sep 88 (manuscript received  
13 Jan 87) pp 1972-1975

[Article by G. N. Pirogova, R. I. Korosteleva, and V. V. Panich, Institute of Physical Chemistry, USSR Academy of Sciences, Moscow]

[Abstract] Technetium catalysts show high activity and selectivity in dehydrogenation of alcohols and cyclic hydrocarbons. Comparison of the catalytic activity of Tc,  $\text{TcO}_2$  and  $\text{TcS}_2$  was carried out in dehydrogenation and dehydration reactions of isopropanol and cyclohexane. The oxide catalysts show the following order of activity in dehydrogenation of isopropanol:

$\text{TcO}_2/\gamma\text{-Al}_2\text{O}_3 > \text{TcO}_2/\text{MgO} > \text{TcO}_2/\text{ZrO}_2$  approximately  
equals  $\text{TcO}_2/\text{Y}_2\text{O}_3 > \text{TcO}_2/\text{Cr}_2\text{O}_3$

Over the oxide catalysts isopropanol is dehydrogenated exclusively; over sulfide catalysts both dehydrogenation and dehydration occurred. All Tc catalysts were active in dehydrogenation of cyclohexane to benzene; the yield depended on the catalyst and on the support material. The following order of activity was noted:  $\text{Tc} > \text{TcO}_2 > \text{TcS}_2$ . Metallic Tc was much more active than the others at low temperatures; at higher temperatures, catalyst poisoning was noted, leading to lower activity. This phenomenon was not observed with the oxide or sulfide catalysts. Figures 3; references: 4 (Russian).

UDC 541.128:542.91:547.313.3:547.535.1-39

**Catalytic Properties of Molybdosiloxane Systems in Epoxidation of Propene With Cumene Hydroperoxide**

18410077b Moscow IZVESTIYA AKADEMII NAUK  
SSSR: SERIYA KHIMICHESKAYA in Russian  
No 9, Sep 88 (manuscript received  
10 Apr 87) pp 1976-1978

[Article by V. N. Leonov, A. A. Belyy, G. A. Stozhkova, M. B. Erman, B. N. Bobylev, and M. Ye. Volpin, Institute of Heteroorganic Compounds imeni A. N. Nesmeyanov, USSR Academy of Sciences, Moscow]

[Abstract] Epoxidation of weakly reactive olefines with cumene hydroperoxide (CHP) in presence of typical molybdenum-containing catalysts occurs with low selectivity. Activity of heterogenic catalysts may be increased by selection of a proper activating carrier: for example, activity of  $\text{MoO}_3$  catalyst on a  $\text{SiO}_2$  carrier is much higher than on any other support. Epoxidation of propene was investigated with catalysts of the CHP system: molybdenylpropanedialate  $(\text{MoPD})(\text{MoO}_2(\text{C}_3\text{H}_7\text{O}_2)_2$

and silanol along with polymolybdodiphenylsiloxane (PMDS) already containing the Mo-O-Si bond system. It was shown that addition of the diphenylsilanediol, triethylsilanol and  $\text{HO}[\text{Si}(\text{CH}_3)_2]_n\text{H}$  to MoPD increased by 25% the yield of epoxypropane. Evidently silanols are capable of modifying the catalytic centers. When PMDS was used as a catalyst, epoxidation was even more selective than with the silanols because the catalytic center was even more stable than with the use of silanols. Figures 2; references 6: 5 Russian, 1 Western.

UDC 541.128.2:541.12.038.2:542.91:547.584-312:547.551

**Autocatalysis and Solvent Effects in Reaction of Phthallic Anhydride With Aniline Derivatives**

18410077c Moscow IZVESTIYA AKADEMII NAUK  
SSSR: SERIYA KHIMICHESKAYA in Russian  
No 9, Sep 88 (manuscript received  
22 Apr 87) pp 1978-1984

[Article by K. K. Kalnins, Institute of High Molecular Weight Compounds, USSR Academy of Sciences, Leningrad]

[Abstract] Detailed study of the acylation of aromatic amines with anhydrides was undertaken covering direct and reversible reactions by solving complete differential equations with consideration of the solvent effect on the course of catalytic reactions. A new analytical method was developed for autocatalytic reactions making it possible to determine rate constants of catalytic and non-catalytic reaction routes from data of one kinetic curve. It was shown that the reversible acylation reaction is of an autocatalytic nature. As compared to  $\text{CHCl}_3$ , all rate constants in  $\text{CH}_3\text{CN}$  increased 2-4 fold and the non-catalytic reaction routes were more sensitive to the nature of the solvent used. Figures 3; references: 7 (Russian).

UDC 541.183

**Cationic Density and Hydrophilicity of Sodium Zeolites**

18410114b Kiev UKRAINSKIY KHIMICHESKIY  
ZHURNAL in Russian Vol 55 No 1 Jan 89 (manuscript  
received 20 Nov 87) pp 31-34

[Article by F. M. Bobonich and V. N. Solomakha, Institute of Physical Chemistry, Ukrainian Academy of Sciences, Kiev]

[Abstract] A study is made of the adsorption of water vapor at 295 K by preliminarily vacuum treating (time, 2 hours; pressure, 0.1 Pa; temperature, 620K) sodium zeolites with varying cation density and their dehydration at temperature increases of  $10^\circ\text{C}/\text{min}$ . The experimental adsorption isotherms are described by a single-term equation derived from the theory of the volumetric filling of microscopic pores. The factor determining the hydrophilicity of the zeolite is the cation density of its

crystals. The concentration of cations in the free volume of the zeolite is related to its chemical composition and the volume of its unit cell, which allows an estimation of the hydrophilicity of the zeolite on the basis of crystal chemical characteristics and, consequently, simplification of the selection of zeolite adsorbents with the required hydrophilicity.

UDC 547.264\*294:541.128

**Catalytic Influence of Diphenylphosphoric Acids in Esterification of Butyric Acid**

18410114e Kiev UKRAINSKIY KHIMICHESKIY ZHURNAL in Russian Vol 55 No 1 Jan 89 (manuscript received 29 Jun 87) pp 76-79

[Article by N. P. Zhiltsov, N. G. Tazimova, and G. V. Semenyuk, Institute of Physicoorganic and Carbon Chemistry, Ukrainian Academy of Sciences, Donetsk]

[Abstract] A study is made of the catalytic activity of diphenylphosphoric acids in the formation of esters with the participation of less reactive acylating agents—the carbocyclic acids. This article studies the catalytic influence of diphenylphosphoric acid and its derivatives on the reaction rate of butyric acid with butyl alcohol at 25°C. The catalytic effect of substituted diphenylphosphoric acids containing the following substituents was also studied: p-methoxy, p-methyl, and p- and m-chloro substituents. A comparison of the results obtained with analogous data on the catalytic activity of the same diphenylphosphoric acids in esterification of chloroanhydrides indicates differences in the influence of the substituents in the catalyst molecule. In the chloroanhydride with butyrylchloride, the substituent has little influence on catalytic activity. In esterification of carboxylic acid, this influence is quite noticeable. The mechanisms of the two processes are probably different, the organophosphorus acids having an acid but not bifunctional mechanism of catalysis in the esterification of carboxylic acids. Figure 1, references 7: Russian.

UDC 541.183.57

**Electron and Geometric State of Vanadium (V) Ion in Vanadium Catalysts**

18410125e Moscow ZHURNAL FIZICHEKOY KHIMII in Russian Vol 63 No 1, Jan 89 (manuscript received 17 Nov 87) pp 227-229

[Article by A. I. Minyayev, I. A. Denysov, and S. N. Babayev, Leningrad Technological Institute imeni Lens-ovet]

[Abstract] The spectral manifestations of various chemical states of vanadium (V) ions on the surface of aluminum silicates and silica gels were investigated by using the methodology of diffusion image electronic spectroscopy and roentgenoelectronic spectroscopy. It was concluded that the chemical state of vanadium (V) ions in vanadium catalysts is the result of the interaction

of vanadium with silicate carriers, which change its geometric structure and electron properties in comparison with crystalline  $V_2O_5$ . As the result of this interaction, vanadium (V) ions are formed in tetrahedral coordination with respect to oxygen and carry on effective positive charge. References: 6 (Russian, 1 by Western authors).

UDC 546.763

**Determination of Trivalent Copper Oxide Enthalpy of Formation and Oxygen Pressure During Its Dissociation**

18410125f Moscow ZHURNAL FIZICHEKOY KHIMII in Russian Vol 63 No 1, Jan 89 (manuscript received 22 Mar 88) pp 265-266

[Article by L. A. Reznitskiy, Department of Chemistry, Moscow State University imeni M. V. Lomonosov]

[Abstract] The presence of  $Cu^{3+}$  makes it urgent to determine the enthalpy of formation of the hypothetical oxide  $Cu_2O_3$ . Assuming that  $Cu_2O_3$  dissociates by the equation  $2 Cu_2O_3 = 4 CuO + O_2 + 63 kJ$ , the oxygen pressure could be calculated for this reaction. Although the calculated values do not pretend to be accurate, they point out the possibility of synthesizing  $Cu_2O_3$  at 700-800 K and  $p(O_2) = 1$  to 6 kbar. Copper in the  $Cu^{3+}$  state can be obtained with the compound  $4Ba_2Cu_3O_7$  at a temperature of about 800 K and a pressure of 1 atm. Figure 1; references 4: 2 Russian, 2 Western.

UDC 66.094.172.001:[661.7:547.466.3-318]

**Effect of Palladium Concentration on Surface Properties and Specific Activity of Benzoic Acid Hydrogenation Catalyst**

18410126a Moscow KHIMICHESKAYA PROMYSHLENNOST in Russian No 1, Jan 89 pp 8-11

[Article by R. V. Chesnokova, L. M. Korabelnikova, D. I. Perazich, B. M. Volfson, V. Yu. Konyukhov, E. V. Igoshina, N. N. Zhivotenko, A. A. Vasilevich, I. V. Rubtsova, and I. M. Genkina]

[Abstract] One of the stages in the production of caprolactam from toluol is the hydrogenation of benzoic acid over a catalyst containing 5 percent Pd on activated charcoal. Substitution of domestic wood charcoal PN for the imported Eponite-113N necessitated an investigation of the formation patterns of the surface properties and structure of the active component. The most important question concerned the relationship of the activity of the catalyst to the surface of the metallic component, which characterizes its specific catalytic activity and the efficient use of the expensive metal. The characteristics of the formation of an active surface and dispersed structure of Pd as a function of its content were studied. It was shown that an increased quantity of Pd on both carriers (PN and Aponite) facilitated development of the metallic surface of the active component. The surface

cover by the active component was slightly higher for Pd/PN. It was shown to be possible to increase the activity of palladium of PN charcoal by changing its preparation method and by regulating its technological parameters, which increases the surface and dispersion of palladium. Figures 2; references: 10 (Russian).

UDC 66.095.253.7:[661.7:547.53]

**Synthesis of Higher Alkylaromatic Hydrocarbons on Zirconium Containing Catalysts**

18410126d Moscow *KHIMICHESKAYA*

*PROMYSHLENNOST* in Russian

No 1, Jan 89 pp 18-19

[Article by Z. G. Busheva, V. N. Melnikov, P. Ye. Matkovskiy, and S. P. Chernykh]

[Abstract] Higher alkylaromatic hydrocarbons (HAH) are used as starting materials for the synthesis of surfactants and as additives to synthetic lubricants, emulsifiers, etc. The synthesis of HAH from ethylene and aromatic hydrocarbons in the presence of a homogeneous catalytic system consisting of zirconium carboxylate-ethylaluminumsesquichloride modified with alkyl halide was investigated. The overall process consists of the oligomerization of ethylene into higher olefins followed by alkylation of the aromatic solvent with these olefins. Thus the synthesis could be carried out in one or two phases. The single-phase system, however, did not give a high yield of the final product; therefore, the two-phase system was selected. After oligomerization of the ethylene on the catalyst system  $Zr(OCOR)_4$ -ethylaluminumsesquichloride-RX, the ethylene was removed from the reactor, and the alkylhalide was introduced into the reactor in a stream of argon and stirred for 10 min to complete the process. References: 10 (Russian, 1 by Western authors).

UDC 66.097.322:546.881.5

**Industrial Technology of Vanadium Catalytic Masses. Communication 1. Preparation of Catalytic Masses**

18410126i Moscow *KHIMICHESKAYA*

*PROMYSHLENNOST* in Russian

No 1, Jan 89 pp 34-37

[Article by V. V. Demin, A. P. Fedoseyev, and V. S. Beskov]

[Abstract] The technology of industrial vanadium catalysts for the oxidation of sulfur dioxide was reviewed. The first section covered the preparation of the catalytic

mass including the formation of the desired size and form of the particles. The following factors were considered in greater detail: Particle morphology of the dispersed phase, electrolytic properties, effect of surface-active compounds, mechanical effect of the equipment, and temperature and moisture of the catalytic mass. Some of these factors often counteract each other, and they should be monitored during the preparation process. For example, activity and mechanical strength are interrelated, but one is usually improved at the expense of the other; hence, a certain degree of compromise must be achieved. Considering such factors results in optimization of the quality of industrial catalysts. Figures 3; references: 29 (Russian).

UDC 66.094.173.004.62/63/66.096.5

**Evaluation of Catalyst Wear in Semiliquefied Systems**

18410126j Moscow *KHIMICHESKAYA*

*PROMYSHLENNOST* in Russian

No 1, Jan 89 pp 51-54

[Article by I. M. Razumov, V. M. Kurganov, G. Y. Dukelskiy, and V. I. Nazarov]

[Abstract] In recent years ternary-phase systems in which liquids, gas, and solid catalyst particles come in contact have gradually become more popular. It is of considerable economic and technical interest to evaluate the losses of solid catalysts in such systems. As an example, the hydroprocessing of a western Siberian petroleum product in a ternary phase pseudoliquefied layer was evaluated on the basis of a pilot plant setup (the reactor was made of stainless steel to avoid errors due to corrosive processes). The experimental results showed that with a rapid gas flow the catalyst losses were 40 percent higher than with a slower gas flow. In general, 3.5-3.9 percent of the solid phase was lost. As a function of time, the greatest losses occurred in the first 100-150 hrs; by 220 hrs the curve began to approach a steady state asymptotically. The losses are due to the breakdown of catalyst granules and to abrasive pulverization on the reactor walls. Each medium and each material appeared to have characteristic coefficients of the breakdown and abrasive wear. A mathematical formula was developed to calculate the loss of catalyst. Figures 2; references: 4 (Russian).

UDC 541.18.046:621.791.35

**Regulation of Properties of Dispersions of Metals  
in Nonaqueous Media**

18410114a Kiev UKRAINSKIY KHIMICHESKIY  
ZHURNAL in Russian Vol 55 No 1 Jan 89 (manuscript  
received 28 Dec 87) pp 28-31

[Article by N. V. Vdovenko, L. B. Fedushinskaya, and Z.  
M. Yaremko, Institute of Colloid Chemistry and Water  
Chemistry, Ukrainian Academy of Sciences, Kiev; Lvov  
University]

[Abstract] A study is made of the influence of modifying  
additives on the interaction between particles in metal  
suspensions. Studies were performed on powders of a  
tin-lead alloy with a weighted mean particle radius of 10

$\mu\text{m}$  and a polydispersion coefficient of 1.6. The specific  
surface of the powder was  $0.05 \text{ m}^2/\text{g}$ , and the number of  
particles per gram amounted to  $0.89 \cdot 10^8$ . Sedimentation  
kinetics studies indicated that the effectiveness of the  
modifying action of nonaqueous media increases in the  
sequence stearic-oleic-cinnamic acid. Micropenetration  
studies were performed to estimate the influence of  
cinnamic acid on the properties of concentrated systems  
with a 90 percent solid phase. It was found that, as the  
content of the modifier increased, the colloidal stability  
and maximum shear stress passed through a maximum  
at around  $5 \text{ g/dm}^2$ . The rheologic characteristics of  
structures based on metal powders are thus related to the  
aggregate stability of the system and are determined by  
the energy of interparticle interactions, which can be  
regulated by modifying the surface of the dispersed  
metal. Figures 3, references 7: 6 Russian, 1 Western.

UDC 541.135

**Impedance of Silver and Nickel Electrodes in Potassium Hydroxide Solution**

18410114c Kiev UKRAINSKIY KHIMICHESKIY ZHURNAL in Russian Vol 55 No 1 Jan 89 (manuscript received 10 Nov 87) pp 45-48

[Article by A. M. Trunov, Odessa Institute of Marine Engineering]

[Abstract] A previous work by the same author reported that impedance studies allow a number of refinements to be made in our understanding of the reaction mechanism of the electroreduction of oxygen. This article presents the results of additional processing of the same data, allowing a more complete interpretation of the process of the ionization of oxygen on silver and nickel electrodes covered with an oxide film in contact with an electrolyte solution with the free access of air. The experiments were performed with electrodes made of thin wires in an electrolyte containing 30 percent KOH. Graphic processing of the experimental results indicates that the diffusion factor has a predominant role in the process. An approximate estimate of the Warburg factor is calculated at  $785 \text{ OHM} \cdot \text{cm}^2/\text{s}^{0.5}$  for  $n=2$ , which is close to the experimental value of  $910 \text{ OHM} \cdot \text{cm}^2/\text{s}^{0.5}$  for silver, indicating the existence of a stage of diffusion of the oxygen molecules with their transformation to perhydroxyl ions, a two-electron process. The experiments indicate that the stage of electron transfer is not significant in the process of the electroreduction of oxygen on metal electrodes. Reference is given to a mechanism with a different predominant kinetic stage, perhaps a heterogeneous chemical reaction. Figures 2, references 10: 9 Russian, 1 Western.

UDC 541.13.183

**Electrocrystallization of Copper on Glass-Carbon Composite**

18410114d Kiev UKRAINSKIY KHIMICHESKIY ZHURNAL in Russian Vol 55 No 1 Jan 89 (manuscript received 30 Nov 87) pp 56-59

[Article by V. A. Belonogiy, V. N. Storozhenko, and Yu. G. Olesov, Dnepropetrovsk Institute of Chemical Technology]

[Abstract] A study is made of electrocrystallization of copper on a glass-carbon material, and several factors determining the size and number of metal crystals formed on the cathode are estimated. Experimental E and  $\tau$  functions were obtained by galvanostatic pulse studies. The cathode studied was a microelectrode of type SU-2000 glass-carbon composite pressed in teflon. The surface of the electrode was preliminarily polished by diamond disks to a mirror-like shine, treated in concentrated sulfuric acid, and washed in double-distilled water. The surface of the material was found to be highly energetically homogeneous with good chemical

resistance, thus allowing it to be recommended as a cathode material for electrolytic precipitation of thin layers of copper, nickel, and other metals. Figures 2, references 10: 9 Russian, 1 Western.

UDC 536.63

**Heat Capacity of Cadmium Selenide in 360-760 K Interval**

18410125a Moscow ZHURNAL FIZICHEKOY KHIMII in Russian Vol 63 No 1, Jan 89 (manuscript received 30 Mar 87) pp 38-40

[Article by V. M. Glazov, A. S. Pashinkin, and A. S. Malkova, Moscow Institute of Electronic Technology]

[Abstract] Although the heat capacity of crystalline cadmium selenide was reported by Sigal and Wiedemeir, their low temperature range values did not agree with other published data. Therefore, the determination was repeated in the temperature range from 360 to 760 K by using DSM-2M differential scanning calorimeter. Literature data on standard entropy ( $86.68 \text{ J/mole} \cdot \text{K}$ ) (were used to calculate the thermodynamic functions of crystalline cadmium selenide for the temperature range from 298.15 to 800 K. Figures 2; references 10: 6 Russian, 4 Western.

UDC 536.63

**Zinc and Cadmium Telluride Heat Capacity in 360-760 K Interval**

18410125b Moscow ZHURNAL FIZICHEKOY KHIMII in Russian Vol 63 No 1, Jan 89 (manuscript received 30 Mar 87) pp 41-43

[Article by A. S. Malkova, Ul. V. Zharov, G. I. Shmoylova, and A. S. Pashinkin]

[Abstract] Because the reported values of the heat capacities of zinc and cadmium telluride, showed poor agreement in the low-temperature interval, they were redetermined in the temperature range from 360 to 760 K by using a DSM-2M differential scanning calorimeter. Published data on standard entropies were used to calculate and tabulate thermodynamic functions of crystalline tellurides. Figures 2; references 9: 4 Russian, 5 Western.

UDC 539.19

**Electron Structure of Pararhodane, Novel Macromolecular Semiconductor**

18410125c Moscow ZHURNAL FIZICHEKOY KHIMII in Russian Vol 63 No 1, Jan 89 (manuscript received 29 Apr 87) pp 115-119

[Article by T. I. Uglova, O. M. Tsyguleva, V. M. Skorobogatov, and I. V. Krivoshey, Kharkov State University imeni A. M. Gorkiy]

[Abstract] The electron structure of pararhodane ( $\text{SCN})_x$ , a novel macromolecular semiconductor, was studied along with its changes during doping. These

characteristics were related to the structure of its macromolecules and experimental electrophysical data. It was previously reported that the electronegativity of  $(\text{SCN})_x$  increased from  $10^{-7}$  to  $10^{-1}$  (Ohm.m) after it was doped with strong proton acids. The stability of electronic structures of pararhodane and its protonated forms were analyzed. Quantum chemical calculations of the electric structure of  $(\text{SCN})_x$ , even without consideration of the interelectron interactions, adequately describe its electron properties, thereby making it possible to develop a model for the proton doping of  $(\text{SCN})_x$ , which explains this sharp rise in conduction by the decreased width of the forbidden zone and the consequently lowered energy gap value  $E$ . References 11. 3 Russian, 8 Western.

UDC 541.67+539.199+536.764+538.221

**Intermolecular Interactions and Appearance of Ferromagnetism in Organic Polymers**

18410125d Moscow ZHURNAL FIZICHEKOY  
KHIMII in Russian Vol 63 No 1, Jan 89 (manuscript  
received 9 Oct 87) pp 135-139

[Article by A. L. Chugreyev and I. A. Misurkin, Physicochemical Institute imeni L. Ya. Karpov, Moscow]

[Abstract] In a previous paper it was hypothesized that polymers with conjugated double bonds and free radical substituents could be possible candidates for organic ferromagnetic compounds. Regular insertion of free radical substituents on only even (or on only odd) carbon atoms of the conjugated chain, whose  $\pi$ -electrons have a tendency to form an antiferromagnetic spin order, would then lead to the polarization of the unpaired electrons of the free radical substituents and form a macromolecule with a complete spin proportional to its length. This result, which is only a special case of the Ovchinnikov theory on the spin at alternative systems, was obtained in the present work as an approximation of a self-consistent field. A model of the ferromagnetic obtained from such macromolecules was analyzed, and the Curie temperature was evaluated. Figures 1; references 15: 1 Russian (2 by Western authors), 4 Western (1 by Russian authors).

**Follow-Up Report on Accidental Ammonia Release at Ionava Plant**

18410159 Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 22 Mar 89 p 2

[Article by R. Motkus, SOTSIALICHESKAYA INDUSTRIYA correspondent, from Lithuania, under rubric "Perestroika—Practice and Problems": "Ominous Cloud"; first paragraph is introduction in source]

[Text] *As we have already reported, a major accident occurred at the Ionava association Azot: a tank containing concentrated liquid ammonia exploded. The collapsed tower, which had a capacity of 10,000 m<sup>3</sup>, contained nearly 7,000 tons of liquid. A fire broke out. A cloud that formed as the result of a chemical reaction began to envelop nearby regions. According to updated information, 5 persons died and 41 were hospitalized, 8 of them in critical condition. Nearly 30,000 persons were evacuated from the danger zone.*

First deputy Chairman of the LiSSR Council of Ministers Yu. Sheris headed the republic's staff for dealing with the aftereffects of the accident. We must point out that they were extremely prompt about getting information out to the people. People could listen in, on republic radio, to telephone conversations of members of the staff and could get information instantly about the degree of contamination of the atmosphere by the gas.

B. Lubis, general director of Azot, explained: "The isothermic ammonia tank exploded at about 11:15 A.M. Everything possible was done to prevent the spilling ammonia from getting into the Neris River. The liquid evaporated after a while, but a nitrophoska [fertilizer] warehouse caught fire. The high temperature caused its thermochemical breakdown."

Minister of Internal Affairs S. Lisauskas said: "The causes of the accident are still unknown. There have never been any such accidents in the LiSSR or, as far as I know, in the country. N. Olshanski, minister for production of the USSR Ministry of Fertilizers, visited the scene of the accident. All possible measures are being taken to stop the thermochemical reaction."

Some inhabitants of Ionava and the nearby villages have been evacuated to Kaunas.

UDC 66.065.2+542.65:541.454/481+628.54

**Precipitation of Iron, Nickel, and Copper Hydroxides and Hydroxycarbonates From Wastewater and Process Solutions**

18410115a Kiev KHIMIYA I TEKHOLOGIYA VODY in Russian Vol 11 No 1, Jan 89 (manuscript received 6 Jun 88) pp 12-25

[Article by V. I. Maksin and Ye. A. Valuyskaya, Institute of Colloid Chemistry and Water Chemistry imeni A. Dumanskiy, Ukrainian Academy of Sciences, Kiev]

[Abstract] This review of the Soviet and Western literature covers methods of precipitation of nickel, copper, and iron hydroxides and hydroxycarbonates along with

the prospects for further utilization of these compounds, which are not only valuable and scarce but in some cases highly toxic. The major alkaline reagents used to precipitate these metals include sodium carbonate, caustic soda, calcium hydroxide, calcium carbonate, magnesium carbonate, calcium oxide, and dolomite. Successive application of two or more precipitating agents can achieve superior levels of purification. Filtration processes have been accelerated by 30-40 percent under laboratory conditions by magnetic treatment of industrial wastewaters. Based on the results of pilot-scale testing, a technological system has been recommended for the simultaneous processing of two types of nickel-containing wastes, yielding pure NiSO<sub>4</sub>·6 H<sub>2</sub>O. References 183: 88 Russian, 95 Western.

UDC 628.543:669.053.4

**Use of Fiber Ionites To Extract Nonferrous Metals**

18410115b Kiev KHIMIYA I TEKHOLOGIYA VODY in Russian Vol 11 No 1, Jan 89 (manuscript received 11 Dec 87) pp 30-32

[Article by G. V. Kuznetsova, M. V. Keskinova, Yu. Ye. Kazakevich, N. V. Bytsan, and Ye. Ya. Danilova, State Institute for Planning Nickel Industry Enterprises, Leningrad]

[Abstract] Results are presented of studies on the sorption of nickel and copper ions by various fiber ionites from model solutions. Studies were performed with ionites based on polyacrylonitrile fiber. The sorption properties of the fibers were estimated from the absorption of metal ions from the aqueous solutions of salts under static conditions at 20°C for 16 minutes with a bath modulus of 1000. Tests using real mine water were performed under dynamic conditions in a 50×300 mm column loaded with 40 g of fiber preliminarily wet in distilled water. It was found that the fiber, after treatment with phosphate polyamines, can be recommended for the purification of mine waters to remove ions of nickel and copper. Ion breakthrough occurred after transmission of 500 volumes of water. Figures 2, references 3: Russian.

UDC 628.34:546.21:544.4:546.267

**Purification of Cyan-Containing Wastewaters by Catalytic Oxidation With Oxygen**

18410115c Kiev KHIMIYA I TEKHOLOGIYA VODY in Russian Vol 11 No 1, Jan 89 (manuscript received 14 Dec 87) pp 34-36

[Article by S.N. Bursova and R. F. Moiseyeva, All-Union Scientific Research Institute of Water Supply, Sewage, Water Development Works, and Engineering Hydrogeology, Moscow]

[Abstract] The authors' institute has developed a new technology for the purification of low-concentration wastewaters based on the oxidation of cyanides with

oxygen in the presence of heterogeneous active carbon catalysts. The chemical changes in the process involve the sorption of cyanides and oxygen on the carbon, oxidation of complex anions, and oxidation and hydrolysis of cyanates and regeneration of the active centers of the catalysts. The technology has undergone long-term pilot-scale testing on an installation with a throughput of 240 m<sup>3</sup>/day. The carbon is regenerated once each 2-3 years to remove carbonate deposits from its surface. The advantages of the method over chlorine oxidation include the following: the process occurs in a neutral medium, which eliminates the consumption of alkaline reagents and the need for subsequent neutralization; there is no secondary pollution of water by salts and residual chlorine; and the process can be automated and requires very little worker's time. Figures 2, references 4: Russian.

UDC 628.3:54-39

#### **Determination of Fatty Acid Peroxides in Wastewaters**

18410115d Kiev *KHIMIYA I TEKHOLOGIYA VODY* in Russian Vol 11 No 1, Jan 89 (manuscript received 23 Jun 87) pp 37-38

[Article by S. I. Sverdllova, T. L. Ivanova, and V. M. Ryabikova, Okhtinsk "Plastopolymer" Scientific Production Association, Leningrad]

[Abstract] The purpose of this work was to develop a method for determining fatty acid peroxides in wastewaters where their content is 10-2,500 mg/l. The influence of a number of factors on the completeness of the extraction of fatty acid peroxides from aqueous solutions was studied, including the ratio of volumes of the phases, extraction time, and pH. Tests performed on the method with actual production wastewaters indicated that the method can be used to monitor the fatty acid peroxide content in industrial wastewaters in the concentration range tested. References 4: Russian.

UDC 621.039

#### **Major Trends in Water Purification Problems in Nuclear Power Engineering**

18410115e Kiev *KHIMIYA I TEKHOLOGIYA VODY* in Russian Vol 11 No 1, Jan 89 (manuscript received 2 Mar 88) pp 41-48

[Article by L. A. Kulskiy, E. B. Strakhov, and A. M. Voloshinova, Institute of Colloid Chemistry and Water Chemistry imeni A. V. Dumanskiy, Ukrainian Academy of Sciences, Kiev]

[Abstract] Major trends in the solution of technological water purification problems at nuclear power plants and power-generating units include (1) the improvement of existing and the development of new methods of removal of dissolved impurities, impurities in the aggregated phase, colloidal impurities, and microscopic impurities carrying

radioactivity and (2) the development of complete economical water purification systems that have a high ecological effectiveness and that make an allowance for the qualitative specifics of heat-transfer media, moderators, and other waters used in typical nuclear power plants. Each of these areas is briefly discussed. No less important than the development and improvement of the methods and equipment themselves is the search for new engineering methods of hardware and structural configuration of devices in order to accomplish the following: improve their productivity, intensify their mass transfer processes, increase the filtering surface of filters without increasing their dimensions, simplify the operations of water purification systems, and allow maximum automation of their operation. References 56: Russian.

UDC 628.3

#### **Decontamination of Municipal Waste Water Sediment by Periodic Centrifuges**

18410115f Kiev *KHIMIYA I TEKHOLOGIYA VODY* in Russian Vol 11 No 1, Jan 89 (manuscript received 28 Dec 87) pp 66-70

[Article by V. M. Murzhenko, Urban Management Scientific Research, Design and Technological Institute, Kiev]

[Abstract] A study is presented of the influence of the type of suspension (moist sludge, active silt) and centrifugation conditions (separation factor, duration) on the process of the dewatering of sewage sediment in pendulum centrifuges and the retention of suspended matter. The precipitation kinetics and the process of dewatering municipal sewage sludge were studied on a laboratory rotary centrifuge. The studies showed that, in contrast to the mechanism of precipitation of sludge, the active silt flocules were not differentiated in the stream, with dewatering beginning with the process of precipitation of the solid phase. The optimal processing time was found to be 2-4 minutes. The rate of precipitation for both polydispersed and monodispersed suspensions first increased and then decreased with increasing centrifugation time. The laboratory data have been used to develop a new design of pendulum centrifuge with mechanical cake removal that is capable of achieving the required effectiveness of the process without the use of coagulants or flocculants. Figures 4, references 9: Russian.

UDC 628.543:678.0:337.087.92

#### **Purification of Tire Industry Wastewaters**

18410115g Kiev *KHIMIYA I TEKHOLOGIYA VODY* in Russian Vol 11 No 1, Jan 89 (manuscript received 14 Apr 88) pp 70-72

[Article by G. V. Sleptsov, Ye. Ya. Sokol, L. F. Marakhovskiy, A. A. Sukhorukov, T. P. Yakovleva, and V. A. Fridman, All-Union Scientific Research Institute of Water Supply, Sewage, Water Development Works, and Engineering Hydrogeology, Kharkov Division]

[Abstract] A study is made of tire industry wastes containing a mixture of latexes, a nontransparent light-

brown fluid with formaldehyde, and a pyridine odor-containing raw rubber dispersed phase at 100-150 g/l with a pH of 9.5-10.2 and with a chemical oxygen demand of 120-140 g O/l. The methods of UV and IR spectrometry and capillary chromatography were used. The analyses indicate the presence of phenols, aldehydes, unsaturated vinyl compounds, and alkyl-substituted benzene and pyridine. It was found that decontamination of the wastewaters required acidification, neutralization of the filtrate, sorption on active carbon, and electrolysis. An installation for this purpose is diagramed. Figures 4, references 6: 4 Russian, 2 Western.

UDC 579.695

**Purification of Phenol-Containing Wastewaters by Bound Microorganisms**

18410115h Kiev *KHIMIYA I TEKHOLOGIYA VODY* in Russian Vol 11 No 1 Jan 89 (manuscript received 17 Nov 87) pp 73-75

[Article by P. I. Gvozdyak, N. F. Mogilevich, N. I. Kulikov, Ye. A. Romanova, and V. I. Nezdoyminov, Institute of Colloid Chemistry and Water Chemistry imeni A. V. Dumanskiy, Ukrainian Academy of Sciences, Kiev; Makeyev Construction Engineering Institute]

[Abstract] The purpose of this study was a microbiological analysis of the population of microorganisms participating in the purification of multicomponent wastewaters from the by-product coke industry to remove phenol. The phenol-containing wastewaters were processed in a 300-m<sup>3</sup> aeration tank separated into three sequential sections by metal barriers. Wastewater with a phenol concentration of 500-1,000 mg/l was fit into the first section, which contained a complex of freely floating and bound microorganisms totaling 3.2-3.7 kg/m<sup>3</sup> as ash-free matter. Investigation of microorganism cultures showed that the phenol destructors were primarily

*Pseudomonas* bacteria. *Pseudomonas* sp. F. utilized 1 g/l phenol per 20 hours of culture time in a liquid synthetic medium. Microbiological analysis of the mixed bacterial population taking part in purification of the complex wastewaters from the coke by-product plant showed that it included only a small portion of active phenol destruction (about 10 percent). Most of the bacterial cenoses were phenol-resistant forms of microorganisms, the development of which in large quantities indicated that they made some contribution to the overall process of biological purification of the production wastewaters. Significant fluctuations in the feed rate or changes in pollutants present sometimes caused significant changes in microbe composition in each stage. References 6: 4 Russian, 2 Western.

UDC 66.074.7:[661.7:547.371]

**Purification of Gaseous Mercury Discharge During Production of Vinyl Esters**

18410126f Moscow *KHIMICHESKAYA PROMYSHLENNOST* in Russian No 1, Jan 89 pp 24-25

[Article by Ye. V. Leontovich, V. I. Irkhin, L. F. Fedorovskaya, and A. T. Stepanova]

[Abstract] A new technological scheme for the purification of abgases from mercury in the production of vinyl esters was proposed. The system consists of two serially placed absorbers filled with AR-B charcoal saturated with iron chloride. Vinyl acetate is adsorbed in the first absorber down to the level of 20 mg/m<sup>3</sup>; in the second mercury is collected, thus purifying the abgas down to 0.01 mg/m<sup>3</sup>. When vinyl acetate begins to pass through the first unit, the unit is also disconnected once mercury begins to pass through it, and the charcoal, which at that point contains about 5 percent mercury, is also sent to the mercury combine for thermal regeneration. This method is generally applicable to the purification of discharged gases in the production of other organic products. References: 5 (Russian).

**Construction of Bereza Chemical Plant Stopped**  
*18410157d Moscow SOTSIALISTICHESKAYA  
INDUSTRIYA in Russian 17 Mar 89 p 1*

[Article by A. Pasechnik, SOTSIALISTICHESKAYA  
INDUSTRIYA correspondent, from Odessa: "It Didn't  
Take Place!"]

[Text] The people of Odessa were alarmed when others wanted to build the Bereza Chemical Plant for manufacture of phosphorus fertilizers in their region. The commission of experts from the country's State Committee for environmental protection made the final decision: construction of the enterprise is unacceptable, because of ecological and economic considerations.

The general public, scientists and labor collectives actively struggled for almost a year against the ill-conceived project of the USSR Ministry of Fertilizers. There were endless discussions on the pages of the local and central press. Finally, the departmental dictatorship was broken. That means, we can?

There is another conclusion: the commission of experts from the country's Gosplan proved conclusively that there is no need to increase the output of phosphorus fertilizers. We must use what we have more effectively, that is, modernize existing production. But another question comes up: Will we always assess departmental appetites so realistically and so promptly?

UDC 631.893:543.226

**Comparative Thermal Stability of Complex  
Phosphoric Fertilizers**

*18410126g Moscow KHIMICHESKAYA  
PROMYSHLENNOST in Russian  
No 1, Jan 89 pp 29-30*

[Article by L. K. Meshalkina]

[Abstract] Substances that produce heat during their breakdown show a tendency toward thermal self-decomposition under conditions of poor heat removal and during storage in large quantities. Mineral phosphoric fertilizers containing ammonium nitrate are such compounds. Determination of their stability by the differential thermal analysis method using small quantities of test material is not adequate because the effect of their heat properties is not considered. An analysis of 40 different mineral phosphoric fertilizers in which the fertilizers were arranged according to their thermal stability was reviewed. Potassium and magnesium sulfates appeared to act as stabilizers for ammonium nitrates, while potassium chloride acted as an active catalyst for their thermal decomposition. Mechanically mixed granulated components are more stable than are the NPK fertilizers obtained from the driers. An increased nitrogen content lowered the thermal stability of these fertilizers. The addition of Mn, I, Zn, and B in amounts of less than 1 percent showed no effect on the stability of ammophoska; Co and Mn lowered their stability. All samples tested were adequately stable during processing, transportation, and storage within the designated technological specifications. References 15: 10 Russian, 5 Western.

UDC 547.583.9

**Reaction of Metallic Thallium With Iodoalkanes**  
18410109e Leningrad ZHURNAL OBSHCHEY  
KHIMII in Russian No 10 Oct 88 (manuscript received  
12 Nov 87) pp 2397-2398

[Article by I. F. Gunkin, E. V. Astakhova, and V. G. Bukharov, Saratov Polytechnical Institute]

[Abstract] The authors have demonstrated the possibility of producing organothallium compounds such as  $R_2TlHg$  ( $R=Alk, Al$ ) directly from metallic thallium dispersions and iodoalkanes. Black thallium powder produced by reducing thallium chloride with potassium in boiling m-xylene in an inert medium is reacted with iodoalkanes to form trialkylthallium that is then converted to more stable dialkylthallium chloride by exposure to hydrochloric acid, with the latter reaction apparently occurring through the intermediate formation of organic compounds of monovalent thallium  $RTl$ , which are disproportionate to  $R_3Tl$  and metallic thallium. References 2: 1 Russian, 1 Western.

UDC 547.342

**Synthesis of Aryl Diethynyl Arsines and Some of Their Properties**  
18410109g Leningrad ZHURNAL OBSHCHEY  
KHIMII in Russian No 10 Oct 88 (manuscript received  
13 Jul 87) pp 2400-2402

[Article by Z. U. Panfilovich, N. R. Ivanova, K. I. Kuzmin, I. I. Kambulova, T. V. Zykova, and I. P. Lipatova, Kazan Institute of Chemical Technology imeni S. M. Kirov]

[Abstract] Continuing work on the synthesis and study of the properties of diethynyl derivatives of arsenic, the authors synthesized for the first time aryl diethynyl arsines by interacting aryl dichloroarsines in tetrahydrofuran. All reactions were performed in dry argon. IR and NMR spectra were used to confirm the composition of the products. References 2: Russian.

UDC

542.91:543.422:541.49:546.732'131:546.34:546.562

**Reactions of Lithium, Cobalt (II) and Copper (II) Ions With Some Phosphoryl- and Acylsubstituted Methylenetriphenylphosphoranes**

18410077e Moscow IZVESTIYA AKADEMII NAUK

SSSR: SERIYA KHIMICHESKAYA in Russian

No 9, Sep 88 (manuscript received

19 Jun 87) pp 2094-2102

[Article by K. B. Yatsimirskiy, E. I. Sinyavskaya, L. V. Tsymbal, T. A. Mastryukova, I. M. Aladzheva, I. V. Leontyeva, and M. I. Kabachnik, Institute of Physical Chemistry imeni L. V. Pisarzhevskiy, UkSSR Academy of Sciences, Kiev; Institute of Heteroorganic Compounds imeni A. N. Nesmeyanov, USSR Academy of Sciences, Moscow]

[Abstract] Phosphonium ylides  $R_3P=CR^+C(O)R''$  are potential ambident ligands with negatively charged C atoms in the  $R_3P^+-C=$  grouping also containing a carbonyl oxygen; in such compounds carbanion is a weaker Lewis base than the O atom so that in reactions with metal salts the metal ion binds through the carbon atom of the ylide group. It was of interest to evaluate the effect of ylide grouping on complex forming properties of  $C=O$  and  $P=O$  groups containing electron donor atoms. Cobalt (II) chloride complexes were synthesized with diphenylphosphoryl substituted acetyl and benzoylmethylenetriphenylphosphoranes; these complexes were characterized by absorption spectra in visible and in the IR ranges and by stability constants in solutions. Stability constants were determined for Li  $[LiL]^+$  and copper (II)  $[CuLCl]^+$  complexes in nonaqueous media for a series of

phosphorane derivatives. It was shown that introduction of an ylide bond  $P=C$  to compounds with aryl and/or phosphoryl groups leads to considerable increase of their complex forming ability. Figures 5; references 14: 6 Russian (2 by Western authors), 8 Western.

UDC 542.91:541.49:547.1'118

**Formation of Binuclear Complexes by Cyclopentand Organophosphoric Complexons**

18410077f Moscow IZVESTIYA AKADEMII NAUK

SSSR: SERIYA KHIMICHESKAYA in Russian

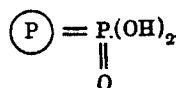
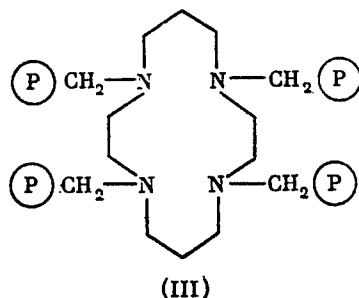
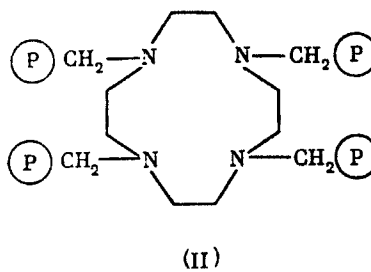
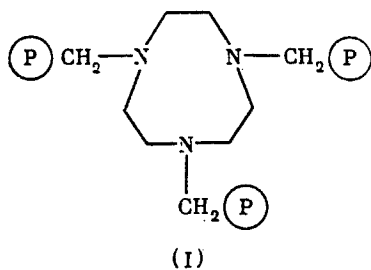
No 9, Sep 88 (manuscript received

13 May 87) pp 2103-2107

[Article by T. Ya. Medved (deceased), M. I. Kabachnik, F. I. Belskiy, and S. A. Pisareva, Institute of Heteroorganic Compounds imeni A. N. Nesmeyanov, USSR Academy of Sciences, Moscow]

[Abstract] Formation of binuclear (homo- and heteronuclear) complexes between the complexons (I-III) and various metals was investigated.

Stability constants for various combinations of normal and protonated binuclear complexes were determined, showing that they increase in the order:  $I < II < III$ . The same order holds for the decrease of conformational strength of the complexons (I)-(III). It was shown that during formation of a binuclear complex  $M'LM''$  (M not equal to  $M''$ ) the second cation binds preferentially via the ionic bond to the  $M'L$  complex. Figure 1; references 17: 11 Russian, 6 Western.



UDC 547.1'118+548.737

UDC 547.26'118

**Altered Synthesis and X-Ray Structural Study of N-Diisopropoxythiophosphorylbenzamide**

18410103c Leningrad ZHURNAL OBSHCHEY  
KHIMII in Russian Vol 58 No 11 Nov 88 (manuscript received 28 Jul 87) pp 2424-2429

[Article by V. N. Solovev, A. N. Chekhlov, N. G. Zabiroy, R. A. Cherkasov, I. V. Martynov, and A. N. Pudovik, Institute of Physiologically Active Substances, USSR Academy of Sciences, Chernogolovka]

[Abstract] This article describes a method of synthesizing structural studies of N-diisopropoxythiophosphorylbenzamide (I), its properties, and the results of an x-ray analysis of it. This compound is a member of a group of compounds that have been shown to have varying degrees of physiological activity. The new method of synthesis involves acylation of diisopropylthioamidophosphate with benzoyl chloride under conditions of interphase catalysis. X-ray structural analysis shows that the crystals produced contain two different molecular conformers connected with the chain by hydrogen bonds such as  $N-H \cdots O=C$ . Detailed geometric parameters of both conformers are presented. Figure 1, references 12: 9 Russian, 3 Western.

UDC 547.241

**Phosphorus-Containing Triazinyl Hydrazines and -(Thio)Semicarbazides. Synthesis and Properties**

18410109a Leningrad ZHURNAL OBSHCHEY  
KHIMII in Russian No 10, Oct 88 (manuscript received 27 Oct 87) pp 2177-2184

[Article by A. F. Prokofeva, Zh. Z. Sapozhnikova, L. A. Pokrovskaya, V. N. Bolkova, V. V. Negrebetskiy, G. V. Golovkin, and N. N. Melnikov, All-Union Scientific Research Institute of Chemical Means of Plant Production, Moscow]

[Abstract] Continuing work in the area of phosphorus-containing derivatives of sym-triazine, the authors synthesized dialkoxy(thio)-phosphorylhydrazinotriazines (I) and dialkoxythiophosphoryl(thio)semicarbazidotriazines (II) and studied their IR, NMR, and mass spectra. The phosphorylated triazinylsemicarbazides are easily hydrolyzed in polar aprotic solvents to form the corresponding dialkylamidothiophosphates. Some dialkylthiophosphorylhydrazinotriazines have inhibited rotation of the hydrazide fragment around the C- $\alpha$ -N bond. The major direction of dissociative ionization of phosphorylated triazinyl(thio)semicarbazides is splitting of the  $\beta$ -NC(X) semicarbazide fragment. References 8: 6 Russian, 2 Western.

**Interaction of Dialkylvinylphosphites With Alcohols and Acids**

18410109b Leningrad ZHURNAL OBSHCHEY  
KHIMII in Russian No 10 Oct 88 (manuscript received 24 Jun 86) pp 2212-2215

[Article by T. Kh. Gazizov, R. U. Belyalov, K. K. Dosmukhambetova, and A. N. Pudovich, Institute of Organic and Physical Chemistry imeni A. Ye. Arbuzov, Kazan Affiliate, USSR Academy of Sciences]

[Abstract] In a continuation of their studies of the reactions of P(III) acids with H-acids in order to develop a convenient method to synthesize mixed P(III) acid anhydrides and esters, the authors studied the reaction of dialkylvinylphosphites with alcohols and acids. Reacting diethyl(3-heptene-4-yl)-phosphite (I) and diethyl-(2-oxo-3-pentene-4-yl)phosphites with acetic acid, the authors produced diethylacetylphosphite, dipropylketone, and acetylacetone. The results are explained by the occurrence of the reaction both through O- and P-protonated intermediates. Phosphorylation of alcohols with dialkylvinylphosphites involves the formation of mixed trialkylphosphites. References 17: Russian.

UDC 547.491.6+26'118

**Three- and Four-Coordinated Phosphorus Cyanides With  $\alpha$ ,  $\beta$ -Unsaturated Aldehydes and Ketones**

18410109c Leningrad ZHURNAL OBSHCHEY  
KHIMII in Russian No 10 Oct 88 (manuscript received 4 Jul 86) pp 2215-2218

[Article by A. N. Pudovik and V. N. Nazmutdinova, Institute of Organic and Physical Chemistry imeni A. Ye. Arbuzov, Kazan Affiliate, USSR Academy of Sciences]

[Abstract] Continuing studies of the chemical behavior of phosphorus cyanides, the authors studied the reaction of these compounds with  $\alpha$ ,  $\beta$ -unsaturated carbonyl reagents. The presence of conjugate bond systems in the molecule allows reaction of the cyanides of phosphorus either at the carbonyl group or with the formation of 1,4-attachment products. The cyanides of 3- and 4-coordinated phosphorus are found to phosphorylate  $\alpha$ ,  $\beta$ -unsaturated aldehydes and ketones at the carbonyl group and form the corresponding esters of P(II) and P(IV) acids. References 12: 7 Russian, 5 Western.

UDC 548.737

**X-Ray-Structural Study of P-[1-(2,2,6,6-tetramethylpiperideno)] -N-[methyl-di(tert-butyl)phosphonyl] Iminophosphine Iodide**  
18410109d Leningrad ZHURNAL OBSHCHEY  
KHIMII in Russian No 10 Oct 88 (manuscript received 19 May 87) pp 2219-2226

[Article by A. N. Chernega, M. Yu. Antipin, Yu. T. Struchkov, V. D. Romanenko, and L. N. Markovskiy, Institute of Heteroorganic Compounds imeni A. N. Nesmeyanov, USSR Academy of Sciences, Moscow; Institute of Organic Chemistry, Ukrainian Academy of Sciences, Kiev]

[Abstract] An x-ray-structural study was performed of the compound mentioned in the title (I). The study demonstrates that there is significant delocalization of  $\pi$ -electron density of the P=N double bond in the P-N=P-group. "Secondary" P...I interaction is observed for the first time in the two-coordinated phosphorus atom. Figures 2, references 21: 14 Russian, 8 Western.

UDC 547.56'118+541.127+542.951

**Anomalous High Conductivity of CH<sub>2</sub> Influence of Group of Aryl Fragments in Phosphinate Series**  
18410109f Leningrad ZHURNAL OBSHCHEY  
KHIMII in Russian No 10 Oct 88 (manuscript received 22 Oct 87) pp 2399-2400

[Article by G. D. Yelisseyeva and V. A. Baranskiy, Institute of Petrochemical and Coal Chemical Synthesis, Irkutsk State University]

[Abstract] In the phosphinate series, anomalously high conductivity is seen in the "normal" CH<sub>2</sub> group bridge. A comparison of the alkaline hydrolysis rate constants of two ethers in water at 25°C indicates that the introduction of the CH<sub>2</sub> group results only in a slight decrease in reactivity, while the sensitivity to the substituent effect is the same. In this case,

$$\alpha_{\text{CH}_2} = 1$$

Further studies will be required to determine whether this is a true intramolecular characteristic. References 11: 8 Russian, 3 Western.

**Drilling of Superdeep Well Is Under Way**  
18410157a Moscow SOTSIALISTICHESKAYA  
INDUSTRIYA in Russian 17 Mar 89 p 1

[Article is a TASS report from Uralsk: "Drilling of a Superdeep Well is Under Way"]

[Text] A well drilled to a depth of 8.5 kilometers will greatly expand our knowledge of the interior of the Caspian oil-and-gas region. V. Edilsultanov's crew from the recently created Caspian Geophysical Expedition of the All-Union Geophysical Production Association "Nedra" began drilling yesterday.

Reaching the planned level will require 7-8 years at an operational cost of approximately 35 million rubles. By comparison, the best crews in the country take a year to drill the 5,000-meter well that has become so commonplace, at a cost of 1.5-3 million rubles. This will be the first superdeep well in sedimentary rock not only in our country, but also in Asia.

"Enormous reserves of petroleum, gas, and condensate have been found at depths of between four and six kilometers," said N. Bashirov, head of the Caspian Geophysical Expedition. "The superdeep well will give us the answer to the question of whether the seam will continue to be productive or whether other, more important discoveries await us."

In the next 10 years, 25 such wells will be drilled in different places in the Caspian region.

The unusually deep drilling has required fundamentally new approaches. For the first time in the world, a titanium alloy will be used to strengthen the drill pipes. The operations are automated, and all the data are processed on a computer, which will make it possible to determine the best and the cheapest method of drilling.

**Solid-Fuel Conversion Prototype Produced for Krasnoyarsk Plant**

18410157b Moscow SOTSIALISTICHESKAYA  
INDUSTRIYA in Russian 17 Mar 89 p 1

[Article by V. Pyrkh, SOTSIALISTICHESKAYA INDUSTRIYA correspondent: "Gas in Place of Coal"; dateline, Krasnoyarsk]

[Text] The first prototype of a gas generator that operates on coal was manufactured for one of the Krasnoyarsk plants in the "KATEKNIUgol" Institute. Almost at the same time, the solid-fuel gasification sector of the institute was transformed into a laboratory.

At one time, our country was one of the leaders in conversion of coal to gas. Just three decades ago, we produced tens of billions of cubic meters of "blue fuel" annually by this method. Then came the oil boom and,

after it, the gas boom. Natural stores of the cheaper energy sources seemed to be inexhaustible. In relying on them, we gave up all other developments.

"Now we are starting from scratch," says S. Islamov, head of the solid-fuel gasification laboratory of the KATEKNIUgol Institute, "There aren't even any records left."

Development of a design for a full-scale experimental unit capable of converting nearly 100 tons of coal into gas per day is being completed at the laboratory. But the start-up of construction of the unit, at one of the KATEK pits, has been moved back to 1991. Just how many years will it drag out, if the unit, with an estimated cost of 2.5 million rubles, covers two whole hectares? Additional time will be needed for setting up operations and getting the bugs out. The developers won't get to production technologies any time soon.

After all, in the United States, for example, designs have been prepared not just for units that convert solid fuel into gas, but also for entire plants. It comes out, and then we try and catch up here later?

The fact that gas produced from solid fuel may, under certain conditions, compete with natural gas is no news to the Siberians. Recently, they completed a feasibility study of the construction of a special shop at the Zykovo Construction Materials Plant. The new technology for gasification of local coals will make it possible not only to make higher-quality bricks, but also to prevent environmental pollution. Analysis shows that burning gas instead of coal is much more efficient.

"This will be the first such shop in our country," Islamov points out. "We will start designing it this year."

Interest is being shown in the developments of the Siberians and of foreign firms, and there are proposals to organize joint enterprises on a mutually advantageous basis.

**Gas-Cleaning Unit Put Into Operation in Uzbekistan**

18410157c Moscow SOTSIALISTICHESKAYA  
INDUSTRIYA in Russian 17 Mar 89 p 1

[Article by R. Tell, SOTSIALISTICHESKAYA INDUSTRIYA correspondent; "Pure Billions"; dateline Karshi, Uzbekistan]

[Text] The most powerful gas-cleaning unit, with an output of four billion cubic meters per annum, was placed in operation at the Shurtansk Gas Complex. Development of Uzbekistan's immense underground deposits in the Karshi Steppe is approaching the planned level. Main pipelines connect the Central Asian republic and the central regions of the country. In this year alone, users will receive almost 16 billion cubic meters of natural gas cleaned with this improved technology.

UDC 66.094.17:[661.7:547.551.54]

**Production Technology for Substituted Aromatic Amines at Normal Hydrogen Pressure**

18410126b Moscow *KHIMICHESKAYA*

*PROMYSHLENNOST* in Russian

No 1, Jan 89 pp 11-13

[Article by V. I. Savchenko and Kh. A. Brikshteyn]

[Abstract] A new production scheme was proposed for synthesizing substituted anilines based on selective liquid phase hydrogenation of nitrobenzenes in the presence of highly dispersed platinum-containing catalysts and normal hydrogen pressure. This method is universal and can be applied to any substituted aniline. The process consists of the preparation of the nitrocompound solution, liquid phase hydrogenation, and isolation of the product. The following compounds were thus obtained: 3,4-dichloroaniline, m- and p-chloroaniline, m-toluidine, o- and p-anisidine, p-phenetidine, p-phenylenediamine, m-trifluoromethylaniline, 2,4,4'-triamino-benzanilide, toluenylenediamine, etc. Figures 3; references: 5 (Russian).

UDC 66.095.253.7:[661.7:547.532]661.7:547.534.1

**Transalkylation of Benzene with Polyethylbenzene in Presence of Boron Trifluoride**

18410126c Moscow *KHIMICHESKAYA*

*PROMYSHLENNOST* in Russian

No 1, Jan 89 pp 13-15

[Article by Yu. I. Kozorezov and V. I. Lisin]

[Abstract] In an attempt to replace imported catalyst for the transalkylation of benzene with polyethylbenzene, several domestically produced catalysts were evaluated. The catalysts were prepared by heating the carriers (aluminum oxides) to 550-600 °C for 5 hrs and saturating them with gaseous  $\text{BF}_3$  at 100-300 °C. They seemed to perform as well as the imported catalysts, yielding a 60 percent and higher conversion rate of polyethylbenzenes at 200 °C and a flow rate of  $1.5 \text{ hr}^{-1}$ ; the best overall results were obtained with the grafted sample A-64M. The following optimal reaction conditions were established: temperature: 180-200 °C, flow rate of the starting material  $1.5\text{-}3 \text{ hr}^{-1}$ , and a molar benzene:polyethylbenzene ratio of 4-6:1. The yield under these conditions ranged from 57 to 67 percent. This yield could not be raised by changing any of the aforementioned variables.

Evidently this incomplete conversion of polyethylbenzene is due to thermodynamic and even possibly to kinetic factors (diffusion of the starting reagents toward the surface of the catalyst). Tables 2.

UDC 661.723.631-13:614.841.22

**Fire and Explosion Hazard Properties of Methylchloroform**

18410126e Moscow *KHIMICHESKAYA*

*PROMYSHLENNOST* in Russian

No 1, Jan 89 pp 22-23

[Article by I. S. Denysenko, F. I. Bondar, V. N. Krivulin, Ye. A. Kudrayavtsev, Yu. Ye. Frolov, S. F. Yevlanov, and A. S. Bratolyubov]

[Abstract] Methylchloroform is used widely as a cleaner and grease remover. Literature data on its fire and explosion hazard are contradictory. Therefore an independent evaluation of these properties was made. Non-stabilized chloroform, 99.8 percent pure (admixture consisted of 0.1 percent trichloroethylene, 0.09 percent tetrachloromethylene and 0.01 percent other impurities) was used. It was shown that methylchloroform does not burn and its flames do not spread out, even at 100 °C. It was concluded that the fire hazard of methylchloroform is due to the presence of stabilizers. When their value reaches 20 percent, methylchloroform becomes easily flammable. Figure 1; references 5: 3 Russian (1 by Western author), 2 Western (1 by Russian authors).

UDC 66.067.1:666.189.2

**Properties of Needle-Pierced Filter Fabrics from Fiber Glass**

18410126h Moscow *KHIMICHESKAYA*

*PROMYSHLENNOST* in Russian

No 1, Jan 89 pp 32-34

[Article by A. I. Bozhko, V. A. Rychko, Ye. G. Vakulenko, S. V. Tkachuk, N. S. Kondakova, and L. A. Budnyk]

[Abstract] In an attempt to develop a heat- and acid-resistant filter material that could replace expensive fluorine, a needle-pierced fabric, was produced from 7A fiberglass. It is a cloth reinforced by repeated piercing with needles containing randomly distributed fiberglass particles (about 60 mm long). This new filter material showed adequate mechanical strength, air penetrability, and resistance to acid. It performed well in humidity-temperature tests; after 60 hours in a humidity chamber it did not lose its strength. Field tests showed that it performed well during a 2-year evaluation period, retaining its original shape and efficiency. Figure 1.

**Commentary on Use of Organic Materials in Electronics**

18410158 Moscow ZNANIYE-SILA in Russian  
No 2, Feb 89 p 43

[Article under rubric "Courier of Science and Technology": "What the Coming Century Has in Store for Us..."]

[Text] They say that the next epoch in the development of our civilization may be the "century of organic materials." What is the source of such hopes? A new area of science—electronics made of organic materials—promises no less than the replacement of all or many of the metal radio parts in devices and computers by polymer components. Much lighter and much more elastic, such components do not get hot and do not corrode. In the future, all electronic devices and all computer hardware will be filled with a "stuffing" of organic radio parts. Is such a thing really possible? It is, according to the research done by scientists in various institutes of the country.

Today, all the requisite types of electronic properties necessary for the creation of such a new component base are being obtained from polymers. We have learned, for example, how to produce true conductors, semiconductors, photoconductors, ferroelectrics, and even superconductors right from polymers and confirmed dielectrics (recall the nonferrous insulation of the wiring in household appliances). Take, for example, polyacetylene, a true organic metal, light and flexible, and a conductor. Semiconductors are used in the creation of new types of transistors and microcircuits. Photoconductors and ferroelectrics are used as sensing elements and detectors of effects of the environment. Superconductors hold new promise for the power engineering of tomorrow. That is what the new field of organics may turn into.

The Institute of Chemical Physics, USSR Academy of Sciences, is considered to be the center of all of this research. There, under the direction of A. A. Ovchinnikov, corresponding member of the USSR Academy of Sciences, various problems of electronics involving organic materials are being worked out. The deputy director of a department of the institute, Valeriy Naumovich Spektor, candidate of physico-mathematical sciences, told us about the latest achievement in this area.

"You can do anything with organic material," Spektor said, "but nobody believed that a true magnet could be made from it. However, the effect itself was predicted by Alexandr Anatolevich Ovchinnikov as early as 1977. But after long, tortuous investigations, experiments, and calculations, a ferromagnet was produced from organic material."

The researcher applied a magnet to a test tube containing a black powder, and all of the powder particles adhered, as it were, to the test tube wall. There was magnetism.

"There's not one atom of iron here," Spektor said. "It's pure polymer, with a complex name—polyacrylonitrile. Chemists know it well, because industry produces hundreds of thousands of tons of it annually. Other well-known polymers—polyvinylchloride, polypropylene, polystyrene—may also possess magnetic properties."

So, we have magnets from polymers. One more step into the electronics of the future. After all, magnets are used extensively in automation, in computers, and in devices that have a lot of sensors. The organic magnet, light and flexible, doesn't heat up or rust.

Our conversation took place in the Department of Electronics From Organic Materials. It is interesting that the scientists themselves here use the word "electronics" only in the sense of the study of the electronic properties of polymers. But, we can't help but begin to see the additional import of the word as it pertains to the electronics of tomorrow.

Throughout the history of man, different periods have been associated with materials that went into the production of the tools of labor. The Stone Age, for example, was replaced by the Bronze Age, which itself was replaced by the Iron Age. Many feel that the Iron Age is still going on today. The creation of organic electronics, as we can see, will greatly enhance the possibilities of electronic hardware and, consequently, its penetration into all spheres of human life. All this is a sign that our civilization is moving to the threshold of the next age—the age of organic materials.

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UDC 678.632'32'21:677.4:532.135

**Rheological Properties of Composition Materials Based on Phenolformaldehyde**

18410101a Moscow PLASTICHESKIYE MASSY in Russian No 11, Nov 88 pp 29-33

[Article by A. V. Bogoyavlenskiy and S. Ye. Artemenko]

[Abstract] Compositions made of phenolformaldehyde oligomers and chemical fibers are used in the production of construction materials. The rheological properties of such materials were investigated; an attempt was made to describe them by using a Barkley-Hershel equation. Analysis of the experimental data showed that rheological properties of the compositions studied may be altered by changing the composition of the phenolformaldehyde oligomers and the content of the chemical fibers, by introducing lubricants and rheological additives, and by using different methods for the production of the pressed material. With proper selection, material could be obtained that is suitable for the process of injection molding. Figures 3; references: 11 (Russian).

UDC 678.652'32'0.024.2

### Technology of Aminoplast Granulation

18410101c Moscow PLASTICHESKIYE MASSY in  
Russian No 11, Nov 88 pp 43-45

[Article by V. I. Tunkel, Zh. P. Terentyeva, O. V. Vyletok, and N. P. Beketova]

[Abstract] One of the most widely used aminoplast materials, KFA2, which comes in powder form can be pressed directly to make the end products. To create an automated system for processing this material, a granulated form is necessary. Granulated materials form practically no dust, store well, and can generally be handled much easier in automated systems than can powders. A methodology for the granulation of aminopolymers based on domestically obtainable equipment was described. Production of this material was initiated. The three main components of this system are a plate granulator, a "boiling layer" drier (a hot air drier), and a sorter. Changing the inclination angle of the granulator determines the size of the granules formed from the powder. The drier consists of three sections: a preliminary drier in which the moisture drops from the initial value down to 4-6 percent, a final drier, and a cooler. The final product has a moisture content of 3.5 percent. Figures 3; references: 2 (Russian).

UDC 678.686.684.82.01:66.085.33

### Effect of $\gamma$ -Irradiation on Properties of Epoxythiocol Compositions

18410101b Moscow PLASTICHESKIYE MASSY in  
Russian No 11, Nov 88 pp 33-36

[Article by V. V. Lyashevich, Ye. V. Roganov, N. M. Sorokin, T. G. Lapushkikna, Ye. N. Taldenkova, and L. A. Igonin]

[Abstract] The properties of epoxythiocol polymers can be changed by varying the hardeners used in the polymerization process. Hardeners from modified aliphatic polyamines and from 2, 4, 6-(dimethylaminomethyl) phenol are of a special practical interest. The properties of epoxythiocol composition obtained by using such hardeners were studied as a function of  $\gamma$ -irradiation. The following driers were used: polyethylenepolyamine (PEPA), monocyanomethylenediethylenetriamine, dicyanoethylenediethylenetriamine, butylmethacrylatediethylenetriamine (DTB-2), and tris(dimethylaminomethyl)phenol. IR spectra were taken of all products to analyze the radiation-polymer interaction. It was shown that the radiation-chemical interaction did affect the properties of epoxythiocol compositions and were a function of the hardener used. At a 10-MGy dose, high radiation stability was exhibited by the sample with the DTB-2 hardener; its stability was due to increased elasticity during the irradiation process. For applications

requiring strength rather than elasticity during the  $\gamma$ -irradiation, the PEPA hardener was recommended. Figures 5; references: 6 (Russian).

UDC 678.84:621.3

### Surface Modification of Silicon-Containing Polymers Under Influence of Glow Discharge Plasma

18410101d Moscow PLASTICHESKIYE MASSY in  
Russian No 11, Nov 88 pp 47-49

[Article by I. P. Chikhacheva, A. M. Yevtushenko, S. D. Stavrova, S. S. Pestov, N. A. Rozemboym, and V. Ye. Konokov]

[Abstract] Polymer properties can be modified by using the posteffect of plasma action on graft polymerization. The postpolymerization of acrylic acid was studied in a search for the optimal conditions of the surface modification of polymer structures. Low-temperature glow discharge plasma was used with a specific power of 2 W/1 and a PRK-4 UV lamp. Acrylic acid polymerization was carried out in a stream of argon at 30-60 ° C. Using plasma resulted in a 10-15 percent loss of polymer mass, indicating some destruction under such conditions. An insufficient number of reactive groups on the surface of the acrylic acid led to a lower degree of polymer grafting by some 30-40 percent. It was also shown that the principal contribution to polymer grafting came from the UV component of plasma, especially in the presence of oxygen. It was shown that changing the relationship of block polymers with different elasticities of their macromolecules made it possible to effectively regulate modifications of the polymer matrix and the resulting properties of the polymers obtained. Figure 1; references 7: 6 Russian, 1 Western.

UDC 678:744.32:66.095.2

### Polymerization of Acrylamide in Presence of Various Impurities

18410097a Moscow PLASTICHESKIYE MASSY in  
Russian No 1, Jan 89 pp 4-8

[Article by V. F. Gromov, O. B. Mikova, A. L. Izyumnikov, T. A. Yakushina, and E. N. Teleshov]

[Abstract] The effect of ethylene cyanohydrin, 3-hydroxypropionamide, 2,2'-dicyanodiethyl ether, and copper ion on the polymerization rate and molecular weight of polyacrylamide was studied. Polymerization was catalyzed by potassium persulfate in the presence of sodium hydroxide. An analysis of the dependence of the maximal polymerization rate on the NaOH concentration in the 0-0.25 mol/L range showed an initial decrease and subsequent linear rise. The molecular weight of the polymer formed varied with the amount of base added. A distinct correlation was noted between unperturbed polymer globule dimensions and the molecular weight as well as the polymerization rate. This indicates that the

macromolecular structure is altered, perhaps by branching. When ethylene cyanohydrin is present, the polymerization rate is unchanged while the molecular weight is lowered. 3-Hydroxypropionamide and 2,2'-dicyanodiethyl ether also decreased the polymer mass, adversely affecting properties such as hydrodynamic effectiveness. Copper ions retarded both radiation polymerization and azobutyric acid-catalyzed polymerization. Small quantities of copper ions accelerated potassium persulfate-catalyzed polymerization, up to  $3.2 \times 10^{-6}M$ . This is connected with the formation of an initiating system between copper and potassium persulfate. At higher copper ion concentrations, participation in chain termination predominates. At all concentrations, copper ion lowers the polymer mass and adversely affects the useful characteristics of the polymers formed. Figures 3; references 6: 4 Russian, 2 Western.

UDC 678:742.2-405.8:66.085.33

**Features of Technology for Obtaining  
Radiation-Cross-Linked Polyethylene Foam**

18410097b Moscow PLASTICHESKIYE MASSY in  
Russian No 1, Jan 89 pp 8-11

[Article by G. N. Matyukhina, A. I. Larionov, S. M. Berlyant, A. P. Semenkova, L. M. Yegarova, and V. P. Pleshanov]

[Abstract] Continuous radiation methods for producing cross-linked polyethylene foam have quality and efficiency advantages over other methods. Adequate mixing of components is essential for the production of high-quality product. Vacuum deaeration and strict temperature control are advisable during extrusion. During irradiation, constant dose adsorption is needed. Optimal foam multiplicity factors are achieved at doses of 0.01 to 0.04 MGy. Due to foam instability, doses of 0.05-0.06 MGy are needed. Stability is directly proportional to the apparent density of the foam. Polyethylene foam can be used in automobile components and packing for optical instruments and radios, for thermal isolation, and for vibration damping. Figures 2; references 5 (Russian).

UDC 678:744.335-13:539

**Structural-Kinetic Inhomogeneity in Products of  
Copolymerization of  
Trihydroxyethylenedimethacrylate With Acrylated  
Butylglycidyl Ester**

18410097c Moscow PLASTICHESKIYE MASSY in  
Russian No 1, Jan 89 pp 11-14

[Article by V. M. Lantsov, B. G. Zadontsev, L. A. Abdrakhmanova, A. V. Kotova, and S. M. Mexhikovskiy]

[Abstract] Polymer structural-kinetic nonhomogeneity was studied by using proton NMR at a frequency of 17 MHz. Trihydroxyethylene- $\alpha,\psi$ -dimethacrylate (TGM-3) was chosen as a trifunctional oligomer and butylglycidyl

acrylate ester (EAS-624) as a bifunctional oligomer. TGM-3 was polymerized in the presence of 0.5 percent dicumyl peroxide. Transverse magnetization attenuation measurements on TGM-3 gave three relaxation times, representing unpolymerized oligomer, low-density transverse cross-linked polymer, and vitreous polymer. Removal of the surface layer of the polymer affected only the intermediate relaxation time. This is due to differing degrees of participation of atmospheric oxygen in polymer hardening, depending on the distance from the surface. Analogous results were obtained for EAS-624, with EAS-624 having a longer intermediate relaxation time than TGM-3. Relaxation properties of the copolymers correlated with the properties of the oligomers. At 0.75 percent EAS-624, the dense cross-link vitrification temperature decreased from 150°C to 50°C. Various proton signals may be assigned to various microscopic environments in the polymer. The data indicate that the nature of kinetic nonhomogeneity is connected with defects arising due to the influence of atmospheric oxygen on polymerization and due to the topological features of a given polymer. Figures 3; references 13: 9 Russian, 4 Western.

UDC 678:743.22-278.01:532.72

**Permeability of Oriented Polyvinyl Chloride  
Membranes**

18410097d Moscow PLASTICHESKIYE MASSY in  
Russian No 1, Jan 89 pp 16-18

[Article by O. L. Vedernikova, L. N. Chernykh, S. V. Vlasov, A. G. Balabyshevich and I. K. Grigoryants]

[Abstract] The permeability of polyvinyl chloride membranes under steep concentration gradients and concentration polarization conditions was measured between 25°C and 45°C. The osmotic cell was filled with saturated NaCl solution. Coefficients of permeability were calculated from the linear portion of the quantity of water passing through the membrane versus time graph, with inclusion of membrane area and thickness. In order to evaluate the effect of polymer orientation, the permeability was measured in membranes with stretch multiplicity values of 1.6, 2.3, 3.1, 4.0, and 4.9. Elevated stretch multiplicity led to decreased water absorption. When the stretch multiplicity was 1.6, at 25°C, mass transfer through the membrane was not observed. The permeability coefficient at 25°C was maximal at a stretch multiplicity of 2.3. It equaled  $5.47 \times 10^{-6} \text{ mL cm/cm}^2\text{-hr}$ . The permeability coefficient decreased with a further increase in stretch multiplicity. When polymer ordering is increased, both the density and polar group ordering increase, which should have opposite effects on permeability. This concept is confirmed by the results obtained. Increasing the temperature increased permeability. This was due to increased segment mobility. Repeating the experiment on the same membrane gave a lowered permeability at 25°C (due to cluster formation)

and elevated the permeability at higher temperatures. Using saccharose rather than NaCl as the osmotic agent greatly decreased the coefficient of permeability. References 7 (Russian).

UDC 678:743.22:678.746.22:678.025.4

**Filtration Material for Purifying Sodium Hydroxide From Mercury**

18410097e Moscow *PLASTICHESKIYE MASSY in Russian* No 1, Jan 89 pp 82-83

[Article by R. N. Zagidyllin]

[Abstract] Existing filtration media for sodium hydroxide do not give high levels of mercury removal, or else they have limited absorption capacities and lifetimes. A polyvinyl chloride-perchlorvinyl resin, an 85:15 copolymer of vinyl chloride with vinyl acetate, and a 1:1 copolymer of styrene and maleic anhydride were used to obtain a modified polyethylene polyamide. When these modified resins were combined with asbestos and graphite at 45-65 percent, enhanced purification effectiveness for mercury resulted. Fourteen such filters were prepared with different types and ratios of constituents. A sodium hydroxide solution containing 0.0032 percent mercury was used to test the filters under vacuum filtration. The mercury content of the filtrate was 0.00001 percent to 0.00009 percent, representing a 72-97 percent purification, as compared with 38-56 percent achieved by conventional graphite and asbestos filters. References 4 (Russian).

UDC 678:742.23.027

**Cross-Linked High-Pressure Polyethylene Composites for Rotating Formation of Large Articles**

18410097f Moscow *PLASTICHESKIYE MASSY in Russian* No 1, Jan 89 pp 86-87

[Article by P. Khakimov, M. K. Asamov, N. A. Tsagarayeva, and B. A. Golender]

[Abstract] Introducing various cross-linking agents into high-pressure polyethylene polymers is an effective way to increase their stability to adverse conditions. The use of diphenylamine as such a cross-linking agent was investigated. The resulting polymer, containing 0.1 percent, 0.2 percent, 0.3 percent, 0.5 percent, or 1.0 percent diphenylamine, was processed on a forming device with rotation around two perpendicular axes of the open hollow form. The chamber temperature was 563 K. An analysis of the results obtained indicated that 0.1 percent diphenylamine was the optimal amount of cross-linking agent. At this level the stability was increased by a factor of two, and the hardness was increased by a factor of three with adequate impact viscosity. The parameters of the formation process did not need to be changed. References 4: 2 Russian, 2 Western.

UDC 678.664:532.135

**Modification of Water-Soluble Polyacrylates by Polyurethane Latex**

18410114f Kiev *UKRAINSKIY KHIMICHESKIY ZHURNAL in Russian* Vol 55 No 1, Jan 89  
(manuscript received 18 Dec 87) pp 89-91

[Article by S. A. Sukhorukova, T. V. Travinskaya, and A. P. Grekov, Institute of High-Molecular-Mass Compound Chemistry, Kiev]

[Abstract] A study is made of the colloid chemical and rheological properties of an anion-active polyurethane latex developed by the authors in a mixture with an aqueous solution of a copolymer of ethylacrylate, methylmethacrylate, and the ammonium salt of acrylic acid. The physicochemical characteristics of films based on the systems are also studied. All of the mixtures are found to be capable of film formation. The strength and relative elongation vary nonmonotonically with composition. Up to a ratio of polyurethane anion-active latex to copolymer of 70:30, there is a slight decrease in strength, followed by an increase with increasing ratio. Relative elongation increases with a low content of the copolymer and decreases with a higher content of the copolymer. This probably results from the plasticizing effect of small quantities of the polyurethane latex. Figures 3, references 6: 5 Russian, 1 Western.

UDC 541(14+64):547.572.1

**Photosensitized Decomposition of Peroxide Compounds in Polyethylene Matrix**

18410114g Kiev *UKRAINSKIY KHIMICHESKIY ZHURNAL in Russian* Vol 55 No 1, Jan 89  
(manuscript received 21 Aug 85) pp 96-100

[Article by P. V. Zamotayev and A. A. Kachan, Department of Petrochemistry, Institute of Physicoorganic Chemistry and Carbon Chemistry, Ukrainian Academy of Sciences, Kiev]

[Abstract] A study is made of the effectiveness of photosensitization of the decomposition of a number of peroxide compounds in polyethylene, naphthalene, anthracene, and benzophenone. Di-tert-butylperoxide, tert-butylhydroperoxide, dicumylperoxide, tert-butylcumylperoxide, and bis-di-tert-butylperoxyisopropylbenzene were used in the work. The high-density polyethylene used had the following parameters:  $\rho=926 \text{ kg/m}^3$ ,  $M_N=9.2 \cdot 10^3$ , and  $M_W=164 \cdot 10^3$ . Of the three active photosensitizers of peroxide decomposition studied, only naphthalene demonstrated the proven presence of the process in polyethylene. The concentrations of aliphatic peroxides and hydroperoxides selected in the study were two to three orders of magnitude higher than the stable concentration of the high-molecular-mass peroxides and hydroperoxides used in photodestruction of

polyethylene, meaning that the contribution of the reactions of photosensitized aromatic compounds sorbed from air to the process of photodestruction of polyolefins can be safely ignored. Figures 2, references 10: 5 Russian, 5 Western.

UDC 541.64:543.51

**Characteristics of Chemical Structure of Fiber Surface Obtained from Aromatic**

18410127a Moscow *KHIMICHESKIYE VOLOKNA* in Russian No 1, Jan 89 (manuscript received 22 Jul 88) pp 8-9

[Article by O. F. Pozdnyakov, B. P. Redkov, and V. S. Yudin]

[Abstract] X-ray photoelectronic spectroscopy was used to investigate the surface layers of fibers and films obtained from polybenzimidazole (PBI) and polyphenyleneterephthalamide (PPTA). The polymers were obtained by low-temperature polycondensation. Experimental data showed that at 300 K there was a deficit of nitrogen atoms compared with the stoichiometric composition of PBI. This was due to the fact that water and solvent (dimethylacetamide) molecules were adsorbed on the surface of the film; indeed after drying the sample at 650 K, these molecules were desorbed, and the surface composition showed the stoichiometric relationship. Fibers made of the PPTA, both the starting ones and those treated with high temperature, also failed to come to the stoichiometric ratios. In addition, significant levels of silicon were found. To remove these impurities, the samples had to be treated at temperatures exceeding their thermal destruction temperatures. Silicon was most probably introduced during the manufacturing of these materials. Figures 1; references 6: 4 Russian, 2 Western.

UDC 677.494.745.32.65.011.46.002.68

**Modification of Polyacrylonitrile Fiber with Hydrolyzed Wastes**

18410127b Moscow *KHIMICHESKIYE VOLOKNA* in Russian No 1, Jan 89 (manuscript received 5 May 88) pp 10-11

[Article by V. M. Kravchuk, Zh. A. Zgibneva, I. Kh. Milyavskaya, K. E. Ergashev, and I. Z. Zakirov]

[Abstract] One promising way of salvaging waste from the production of chemical fibers. One of the problems with this approach was the poor solubility of such wastes. It was resolved successfully by partial hydrolysis of the wastes. This report covers the alkaline hydrolysis of nitron fiber production wastes and their solution in 51.5 percent aqueous sodium thiocyanide. The optimal solution was achieved with a static exchange capacity (SEC) of 0.17-0.20 mg-Eg/g. Solutions obtained in this fashion had a lower viscosity and a lower content of gel particles

and hence were much easier to filter. The addition of 5 percent of hydrolyzed wastes yielded fibers with improved physicochemical properties. Figures 2; references: 3 (Russian).

UDC 678.067.677.529.543.226

**Investigation of Properties of Chemically Stable Carbon Plastic**

18410127c Moscow *KHIMICHESKIYE VOLOKNA* in Russian No 1, Jan 89 (manuscript received 14 Jun 88) pp 13-15

[Article by V. N. Kurguzov, I. N. Andreyeva, P. V. Vlasov, M. Ye. Kazakov, N. V. Chichinova, A. T. Kalashik, and N. N. Prudnikov]

[Abstract] The properties of a hybrid carbon plastic were studied; this material is used in the production of chemically stable pipes and other technological equipment. The test samples were prepared by the contact method. Because of the polycomponential nature of these composites, it was difficult to relate the results to individual components. Therefore, comparative analysis of samples differing by only one parameter were carried out. Analysis of specimens from three different materials showed that during the heating process the following took place: up to 70 °C, the solvent evaporated; between 60 and 150 °C, solidification of resins occurred; and in the range of 150 to 300 °C, the binder became oxidized, and intermolecular crosslinking occurred. It was noticed that the molecular weight of the binder affected the chemical reactions and destructive processes occurring in these materials. It was shown that the thermal analysis method was useful in determining the carbon plastic's properties as a function of their methods of preparation as well as in monitoring the destructive processes during their utilization in aggressive media. Figures 3; references: 4 (Russian).

UDC 677.494.745.32-486.32.021.125.2

**Formation of Hollow Fibers from Polyacrylonitrile in Degassed Vats**

18410127d Moscow *KHIMICHESKIYE VOLOKNA* in Russian No 1, Jan 89 (manuscript received 14 Jun 88) pp 15-17

[Article by V. M. Girshgorn, L. P. Perepechkin, L. N. Kiseleva, A. Ye. Polotskiy, S. V. Tsareva, V. D. Filipova, and G. A. Mikheleva]

[Abstract] Hollow fibers used to separate liquid mixtures are formed in precipitation vats (of water) passed through the fiber channel. The effect of degassed water as a precipitator was evaluated in the process of the formation of semipermeable hollow fibers from an acrylonitrile-methacrylate copolymer solution in dimethylacetamide. Two methods for forming these materials were tried: passing water through channels and immersing the fiber in the vat. Distilled degassed water was used in the

test runs, distilled nondegassed water in the controls. It was shown that fibers formed in degassed water retained molecules with lower molecular weights that were more permeable to water at the higher formation temperatures of such fibers; the fibers were shown to have an increased homogeneity. Figure 1; references: 9 (Russian).

UDC [677.464.1:577.152]:539.217.1

**Investigation of Structure Fiber-Biocatalyst Containing Modified  $\beta$ -Galactosidase**

18410127e Moscow *KHIMICHESKIYE VOLOKNA in Russian No 1, Jan 89 (manuscript received 30 Jun 88) pp 21-23*

[Article by D. V. Matveyev, S. B. Krasovskaya, N. R. Kildeyeva, S. A. Kukushkina, L. Ya. Konovalova, G. S. Negodyayeva, and A. D. Virnik]

[Abstract] The porosity and catalytic characteristics of fiber-biocatalyst (FBC) containing the modified enzyme  $\beta$ -galactosidase were studied as a function of the conditions of their preparation. It was shown that during the formation of FBC in a soft precipitant the immobilization effectiveness could be lowered and the stability of the enzyme increased by altering the spinning composition or the fiber formation conditions. During the formation process in which solid precipitants were used (hexane or decane), the specific surface and the specific pore volumes increased due to the increased fraction of small-radius pores, which lowered the activity of FBC but increased their stability. Thus, it was shown to be possible to regulate the catalytic properties of FBC by altering the structure of the fibers. Figure 1; references 10: 8 Russian, 2 Western.

UDC 677.463.044.17

**Use of Domestic Modifiers in Production of Highly Modulated Viscose Fibers**

18410127f Moscow *KHIMICHESKIYE VOLOKNA in Russian No 1, Jan 89 (manuscript received 24 Feb 88) pp 25-27*

[Article by L. G. Tokareva, S.A. Kovaleva, N. S. Safronova, N. A. Chentsova, Ye. Ya. Migacheva, Zh. A. Bedina, and A. N. Bondarev]

[Abstract] Modifiers are used to prepare highly modulated viscose (HMF) fibers. Aliphatic and aromatic amines can be used as modifiers, the imported modifier Berol-Visco 341 being one of the best. The possibility of using domestically produced higher aliphatic amines  $C_{17}$ - $C_{20}$  to prepare modifiers for the production of HMF fibers was studied. The physicochemical and colloidal properties of various samples were determined. The most suitable specimen obtain from synthetic fatty amines with a negligible content of  $C_{21}$ - $C_{25}$  homologues was used as the modifier for the production of the HMF fiber. The material obtained proved to be comparable to the fiber obtained with Berol-Visco 314 modifier in all aspects. References: 4 (Russian).

UDC 539.4

**Relationship Between Strength of Complex Organic Fibers and Organic Plastic Based on Such Fibers**

18410127g Moscow *KHIMICHESKIYE VOLOKNA in Russian No 1, Jan 89 (manuscript received 18 Mar 88) pp 27-29*

[Article by S. L. Bazhenov, A. A. Berlin, A. M. Kuperman, and E. S. Zelenskiy]

[Abstract] An attempt was made to determine the relationship between the strength of complex poly-p-aminobenzimidazole (PABI) fibers and the strength of organic plastic material obtained from them. Average breaking loads of nontwisted PABI fibers differ considerably from those of the plastic materials. The problem was even more complex with twisted fibers, where no correlation was observed even with 30-mm-long fibers. The quality of twisted complex fibers may be estimated only from the average strength of elemental fibers or from the breaking load of the microplastic material. Figures 2; references: 6 (Russian).

UDC 634.0.864.2

**Influence of UV Radiation on Structure and Properties of Lignosulfonates**

18410084a Riga *KHIMIYA DREVESINY* in Russian  
No 5, Sep-Oct 88 (manuscript received  
4 Jun 87) pp 61-66

[Article by A. V. Soms, G. M. Shulga, and G.M. Telysheva, Institute of Wood Chemistry, Latvian Academy of Sciences]

[Abstract] A study is made of the influence of UV radiation on the chemical structure and binder properties of sodium ligosulfonates extracted from sulfite wash. IR spectra were measured in tablets with KBr in the 3,800-400  $\text{cm}^{-1}$  interval. The spectra of specimens subjected to 20 hours of irradiation showed a tendency toward increased absorption at 1,270, 1,220, 1,150, and 1,030  $\text{cm}^{-1}$ . Increasing radiation time decreased the relative intensity of the absorption bands at 1,030-1,270  $\text{cm}^{-1}$ . At 170 hours, absorption at 3,400  $\text{cm}^{-1}$  becomes weaker, and its maximum shifts to 3,430  $\text{cm}^{-1}$ , while the relative intensity of the bands at 1,600 and 1,510  $\text{cm}^{-1}$  remains unchanged. UV radiation thus causes oxidative destruction of lignosulfonate macromolecules accompanied by breaking of simple ether bonds, demethoxylation, and the formation of aliphatic, and aromatic carbonyl and carboxyl groups. Irradiation increases the content of medium- and low-molecular-mass fractions. Figures 4, references 12: 9 Russian, 3 Western.

UDC 634.0.864:541.183.12

**Production of Modified Hydrolysis Lignin With Ion-Exchange Properties**

18410084b Riga *KHIMIYA DREVESINY* in Russian  
No 5, Sep-Oct 88 (manuscript received 13 Jul 87; after  
revision 26 Feb 88) pp 67-69

[Article by G. P. Potapov, E.I. Fedorova, and L. A. Nikulina, Syktyvkarskiy State University; Syktyvkarskiy Affiliate, Leningrad Wood Technology Academy imeni S. M. Kirov]

[Abstract] Acrylamide was grafted into lignin in the presence of bisdiazonium-2,4-phenylenol in an aqueous medium, and the influence of various ratios of bisdiazonium salt to acrylamide on the process of modifying lignin and its adsorption properties was studied. The process was performed at 60-80°C for 3 hours with energetic agitation of the reaction mixture. The product was carefully washed in hot water and dried to a constant mass, and its adsorption properties for titanium (IV) salts were studied. The possibility was thus demonstrated of modifying lignin with bis-diazonium salt-acrylamide oligomers. The adsorption properties of the modified lignin were studied by a static method. The maximum adsorption was observed in a specimen to which acrylamide was added after the bisdiazonium salt. Figures 2, references 5: 2 Russian, 3 Western.

UDC 547.854'466.318

**Synthesis of Acyclic Analogues of Nucleoside  
Antibiotics**

*18410109h Leningrad ZHURNAL OBSHCHEY  
KHIMII in Russian No 10 Oct 88 (manuscript received  
12 Dec 86) pp 2404-2405*

[Article by V. A. Timoshchuk and T. I. Olimpiyeva,  
Belorussian Scientific Research Institute of Epidemiol-  
ogy and Microbiology, Minsk]

[Abstract] The authors obtained the first representative of a new type of nucleosidoamino acid. The possibility of using the properly protected DL-serine in the synthesis of an acyclic analogue of polyoxine C is demonstrated. Chloromethylation of the N-benzoyl-DL-serine derivative produced yields an N-benzoyl-O-chloromethyl-DL-serine derivative, the condensation of which with 2,4-O-bis(trimethylsilyl)uracil in acetonitrile results in the formation of the N<sup>1</sup>-[(methyl ester of N-benzoyl-DL-serine-O-)methyl]-uracil with a yield of 25 percent. References 4: Western.

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